



**UNITED STATES DEPARTMENT OF COMMERCE**  
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
09/052,688	03/31/98	CLEVINGER	L 98P7476US

MM42/1117

SIEMENS CORPORATION  
INTELLECTUAL PROPERTY DEPARTMENT  
186 WOOD AVENUE SOUTH  
ISELIN NJ 08830

EXAMINER

GUAY, J

ART UNIT

PAPER NUMBER

2814

DATE MAILED: 11/17/99

**Please find below and/or attached an Office communication concerning this application or proceeding.**

**Commissioner of Patents and Trademarks**



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11

DATE MAILED:

This is a communication from the examiner in charge of your application.  
COMMISSIONER OF PATENTS AND TRADEMARKS

- ☒ This application has been examined. ☒ Responsive to communication filed on 9/27/99 ☒ This action is made final.
- A shortened statutory period for response to this action is set to expire THREE (3) month(s), --- days from the date of this letter.
- Failure to respond within the period for response will cause the application to become abandoned. 35 U.S.C. 133

Part I THE FOLLOWING ATTACHMENT(S) ARE PART OF THIS ACTION:

- |   |  |
|---|--|
| 1. <input type="checkbox"/> Notice of References Cited by Examiner, PTO-892.        | 2. <input type="checkbox"/> Notice re Patent Drawing, PTO-948.                   |
| 3. <input type="checkbox"/> Notice of Art Cited by Applicant, PTO-1449.             | 4. <input type="checkbox"/> Notice of informal Patent Application, Form PTO-152. |
| 5. <input type="checkbox"/> Information on How to Effect Drawing Changes, PTO-1474. | 6. <input type="checkbox"/> _____  |

Part II SUMMARY OF ACTION

1. ☒ Claim(s) 1-27 are pending in the application.
- Of the above, claim(s) 6 and 16-27 are withdrawn from consideration.
2. ☐ Claim(s) \_\_\_\_\_ has been canceled.
3. ☐ Claim(s) \_\_\_\_\_ is allowed.
4. ☒ Claim(s) ~~1-5~~ 1-5 and 7-15 are rejected.
5. ☐ Claim(s) \_\_\_\_\_ is objected to.
6. ☒ Claim(s) 1-27 are subject to restriction or election requirement.
7. ☐ This application has been filed with informal drawing(s) under 37 C.F.R. 1.85 which are acceptable for examination purposes.
8. ☐ Formal drawing(s) are required in response to this Office action.
9. ☐ The corrected or substitute drawings have been received on \_\_\_\_\_ . Under 37 C.F.R. 1.84 these drawings are ☐ acceptable. ☐ not acceptable (see explanation or Notice re Patent Drawing, PTO-948).
10. ☐ The proposed additional or substitute sheet(s) of drawings, filed on \_\_\_\_\_ has (have) been ☐ approved by the examiner. ☐ disapproved by the examiner (see explanation).
11. ☐ The proposed drawing correction(s), filed on \_\_\_\_\_ , has been ☐ approved. ☐ disapproved (see explanation).
12. ☐ Acknowledgment is made of the claim for priority under 35 USC 119. The certified copy has ☐ been received ☐ not been received ☐ been filed in parent application, serial no. \_\_\_\_\_ ; filed on \_\_\_\_\_ .
13. ☐ Since this application appears to be in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under Ex parte Quayle, 1935 C.D. 11; 453 O.G. 213.
14. ☒ Other

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Claims 6 and 16-27 stand withdrawn from further consideration by the examiner, 37 CFR 1.142(b) as being drawn to a non-elected species. Election was made **without** traverse in Paper No. 10.

Claims 1-5 and 7-15 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In Claim 1, the limitation "to improve electromagnetic lifetime of the conductor" is vague and indefinite. While the disclosure describes *electromigration lifetime* problems in the prior art, it is not clear what metes and bounds "electromagnetic lifetime" defines. Claims 2-5 and 7-15 are rejected as indefinite since they depend from an indefinite base claim.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the

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contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(f) or (g) prior art under 35 U.S.C. 103(a).

Insofar as definite or understood, Claims 1-5, 7, and 9-15 are rejected under 35 U.S.C. 103(a) as obvious over the present admissions of prior art taken with Sumi, of record.

With respect to Claims 1-5, 7, and 10-14, Sumi teaches using amorphous titanium nitride liner coatings to line contact vias within insulators which are subsequently filled with aluminum in order to prevent diffusion of aluminum or silicon into the underlying substrate. Sumi also teaches a titanium sublayer 9 underlying amorphous TiN barrier layer 10. Sumi further discloses a 300 angstrom Ti liner thickness and a 700 angstrom TiN liner thickness. Use of so formed amorphous liners in disclosed conventional damascene structures would have been obvious for this reason. Regarding "improved electromagnetic lifetime of the conductor," Sumi's layer prevents Al diffusion and thus prevents increase in contact resistance. Sumi therefore teaches a structure which has increased electromagnetic lifetime with respect to line resistance. Secondly, the present admissions of prior art cite Tracy, et al., which teaches that aluminum alloys formed on non-textured surfaces such as TiN tend to assume the underlying film texture. It is therefore believed that Sumi's aluminum layer 11 is of amorphous character since its

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underlying layer is amorphous. And assuming applicants intend the recitation "electromagnetic" to actually read "electromigration," the structure of the prior art inherently possesses these characteristics, at least to some extent, since the structure has liner and conductive materials with random grain boundaries as claimed. *In re Pearson* 181 USPQ 642, *ex parte Minks* 169 USPQ 120, and *In re Swinehart, et al.*, 169 USPQ 226, make it clear that an intended use for, or a property inherent in, an otherwise old composition does not differentiate claimed composition from those known to prior art, i.e., does not distinguish the claimed structure from that of the prior art. Applicant is required to prove that the subject matter shown to be in the prior art does not possess characteristics relied upon.

With respect to Claim 15, since applicants failed to show a critical nature of the claimed thicknesses pertaining to unexpected results, further noting that it is well known in the art that to some extent scaling for higher density requires thinner device layers as well as in cases where low current handling capacities are intended, and that Sumi teaches 4000 angstrom Al layers (column 4, lines 24-25), the claimed 3700 angstrom thickness would have been obvious to one of ordinary skill in the art because when general conditions of a claim are disclosed in the prior art, it is not inventive to discover

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optimal or workable ranges by routine experimentation. In re Aller, 220 F.2d 454, 105 USPQ 233, 235 (COPA 1955).

With respect to Claim 9, the limitation "N<sub>2</sub>/H<sub>2</sub> plasma treated titanium nitride" is directed to a process for forming an amorphous TiN layer. "Product by process" limitations in claims drawn to structure are directed to the product per se, no matter how actually made, see *In re Thorpe*, 227 USPQ 964, which makes it clear that it is the patentability of the final product per se which must be determined in claims having "product by process" limitations, and not the patentability of the process, and that, as here, an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not. Note that applicant has the burden of proof in such cases, as the above caselaw makes clear. In the instant case, applicant must prove that the TiN nitride layer of Sumi could not possibly possess characteristics relied upon by the process limitation. Incidentally note that Sumi teaches use of H<sub>2</sub> for forming the amorphous layer (column 5, line 7), and thus teaches an amorphous TiN layer which contains some hydrogen.

Claim 8 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112 set forth in this Office action and to include all of the limitations of the base claim and any intervening claims. In Claim 1, changing "electromagnetic" to --

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electromigration-- would overcome the indefiniteness of the rejected claims.

The 2/16/99 remarks have been considered, but are not deemed persuasive. Use of Sumi's structure within well known damascene metallization schemes would have been obvious for reasons given. Random grain boundaries within an overlying conductor formed on amorphous liners would have been an inherent result in Sumi, as evidenced from the admitted prior art to Tracey, et al. Applicants' arguments regarding Sumi's failure to discuss electromigration problems, and how past metallization films were highly textured for preventing electromigration effects are noted, however, discovery of new properties within an old composition does not differentiate claimed structures from the prior art.

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for response to this final action is set to expire THREE MONTHS from the date of this action. In the event a first response is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event will the statutory period for response expire later than SIX MONTHS from the date of this final action.

Serial Number 09/052688

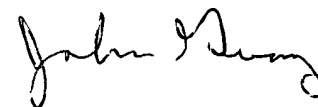
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The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

U.S. Patent No. 5,397,744 is an English equivalent of Japanese Kokai 4-267359.

Any inquiry concerning this communication should be directed to John Guay at telephone number (703) 305-3507.



**JOHN GUAY  
PRIMARY EXAMINER**